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(Guest: Experiments with Economic Tapping Systems (3). Tapping-cum-Manuring-Experiments on Young Mature Rubber Trees—Part I)

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EXPERIMENTS WITH ECONOMIC TAPPING SYSTEMS (3)

TAPPING-CUM-MANURING EXPERIMENTS ON YOUNG MATURE RUBBER TREES: PART I

BY

EVAN GUEST

Summary

1. The results for the first year of three tapping-cum-manuring experiments in a new series on young mature rubber trees are presented (two experiments on budded, one on seedling trees). Full details of the layout of each experiment are given in the Appendix.

2. No fertiliser effects have yet been detected, either in growth or in yield. Only tapping results are discussed in this paper.

3. The reduction of tapping intensity to 67 per cent in the "A.B.C." periodic tapping systems has resulted in a loss of crop of approximately 25 per cent (200-250 pounds per acre) as compared with the normal 100% continuous tapping system. The *yield per tapping* has however been higher in the 67% periodic systems and in consequence tapping cost has been reduced by about 10 per cent.

4. Daily periodic tapping has also proved more efficient than the normal alternate-daily system in one experiment. With daily tapping the percentage of low-grade crop is less than with alternate-daily tapping, but the wide range in d.r.c. throughout the month is a drawback. In the two experiments on nine to ten-years-old budgrafts monthly periods of tapping and rest have proved too long for optimum yields, and shorter periods are now being tested.

5. Negative correlation between growth and yield (or tapping intensity) is shown in all three experiments. Differences in growth-rates, though small, suggest that early results should be treated with caution, and judgment withheld until the experiments have been running for several years.

Introduction

To continue the series of tapping experiments initiated in 1933 (Sharp, 1938), six new experiments were laid out on old seedling rubber trees in 1938. At the same time three new experiments were set up on young mature trees to study the effects of manuring combined with various systems of tapping. The arrangement of these three experiments is now described together with the results

of the first year in part I of a series of papers which will be published under the general heading "Experiments with Economic Tapping Systems (3)." Part I of another series of papers dealing with the other six experiments, under the heading "Experiments with Economic Tapping Systems (2)," (Russell, 1941) is in course of preparation and will be published shortly. Sharp's series of papers (1934-1938), giving details of the Seventh Mile Estate experiments, appeared as "Experiments with Economic Tapping Systems (1): Parts I to VII."

Two of the tapping-cum-manuring experiments were set up on budgrafts, one on seedling trees. On the first site selected (Experiment No. 32) the experimental material was a rather backward monoclone stand of B.D. 5 budgrafts planted on almost flat virgin clay; these budgrafts were just reaching tappable standard, 7½ years from the date of budding. Experiment No. 31 was set up on a polyclone stand of Prang Besar clones 9-10 years from budding, which had been in tapping for 3¼ years. The third Experiment (No. 36) was laid out on a thirteen-years-old stand of seedlings which had been in tapping for nearly five years.

A full description of the site, crop and layout of each experiment, with a plan showing arrangement of plots, tapping particulars and details of the method of recording, is given in the Appendix to this paper (pp. 160-177), both for present and future reference. What follows in the text below deals with the first tapping year only. As might be expected, comparison of growth and yields on manured and unmanured plots does not yet reveal any fertiliser effects. Discussion of the manurial side of the experiments is therefore deferred until a later publication.

Tapping Results for First Year (1938-1939)

Results for twelve months for each experiment are discussed in turn, being illustrated in the main body of the paper by means of graphs showing the yield of grade 1 rubber from month to month, as a percentage of the control. Tables giving a full summary of the data are given in the Appendix, for each experiment, following the detailed description of that experiment.

Experiment No. 32 (on clone B.D. 5)

For this experiment a suitable site was found at Sogomana Estate, near Lumut, Perak. The plots were marked out in June—July 1938 before the trees had been tapped. Owing to the slow early growth of buddings of B.D. 5, it was necessary to make a slight reduction in the standard of tappability. All trees from

18 inches in girth upwards were brought into tapping on a half-spiral cut at 25 inches above the union, and preliminary plot-yield records were taken during August on alternate-daily tapping (S/2,d/2,100%).

Tapping of plots in accordance with experimental schedule began on September 1st; the first fertiliser dressing was applied early in September. Strips were cleared of cover between the tree-rows and the soil surface lightly forked on unmanured control plots (manurial treatment m.O.) as well as on all manured plots (treatments m.1, m.2 and m.3). Comparative data for the year on each of the two tapping systems (treatments t.1 and t.2) are presented in Table I, (see Appendix, p. 163), where the original relative yield-level of each set of plots is indicated. The relative yield and relative tapping cost on each of the two systems has been calculated, and the relative intensity checked from the actual amount of tapping per plot. Relative intensity could further be corrected from the actual number of tree-tappings recorded if it were considered desirable to eliminate the effect of month-to-month fluctuations* in the numbers of trees in tapping per plot.

So far as can be judged from present results, there does not appear to be much to choose between the two tapping systems in this experiment. The following points may be noted:

(a) *Yield.* The slight gain in yield (3½ per cent on the daily periodic system) does not adequately compensate for the 6 per cent greater tapping intensity.

(b) *Tapping cost.* At Sogomana Estate a "flying start" is part of normal routine on daily periodic tapping. The tappers receive no extra payment for re-opening cuts at the end of each resting period: the small crop from two initial afternoon tappings is collected with the scrap on the first normal tapping day.

Task-size is the same on both systems (300 trees). The slight gain in yield on the periodic system therefore means a small reduction in tapping cost. The respective tapping costs were 2.95 cents per pound on alternate-daily and 2.86 cents per pound on daily periodic. Periodic tappings with a "flying start," for which the tappers received no extra payment, was about 3 per cent cheaper; but this small margin would disappear, and the position perhaps be reversed, if extra wages had to be paid for the two afternoon tappings of the "flying start" each month.

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* The plots of this experiment were marked out as equal tasks of 300 tappable trees each, but the number of trees in tapping per plot never remain constant for long. Trees go dry or are lost by wind damage, while new trees are brought into tapping periodically as they reach the required girth standard. That the average effect of these fluctuations in tree numbers throughout the year has probably been negligible is indicated here by the close approximation of relative intensity per tree to relative intensity per plot. In other experiments however it may be important to adjust the figures.

(c) *Bark consumption.* In spite of the greater amount of tapping as a result of "flying-starts," on the daily periodic system the net rate of bark consumption (23 cm, or say 9 inches, per annum) was no higher than in normal alternate-daily tapping.

(d) *Proportion of low-grade rubber.* The percentage of scrap was slightly less on daily periodic than on alternate-daily tapping (10 per cent and 11 per cent respectively).

(e) *Dry rubber content of latex.* The mean monthly d.r.c. was about 1 per cent less on the daily periodic system.

(f) *Growth.* Girth increments of trees tapped on the two systems were in inverse order of tapping intensities and yields. The difference is small, but suggests a negative correlation between growth and yield which may later become accentuated. Negative correlation between growth and yield has been noted elsewhere (Mann, 1938; Sharp and Guest, 1939); it is also suggested by the early results of the other experiments described in this paper.

Progress of Total Yield

The total monthly yields of No. 1 rubber only and the mean monthly d.r.c. on each tapping system are presented in Table II, (see Appendix, p. 164). The progressive total yields for treatment t.2 expressed as percentage of the control (t.1) are also given. Trend of yield is shown graphically in Fig. 1, in which the blue line shows the monthly yield of the daily periodic system as a percentage of the yield of the control (*i.e.* continuous alternate daily tapping), which is indicated by the horizontal bold black line.

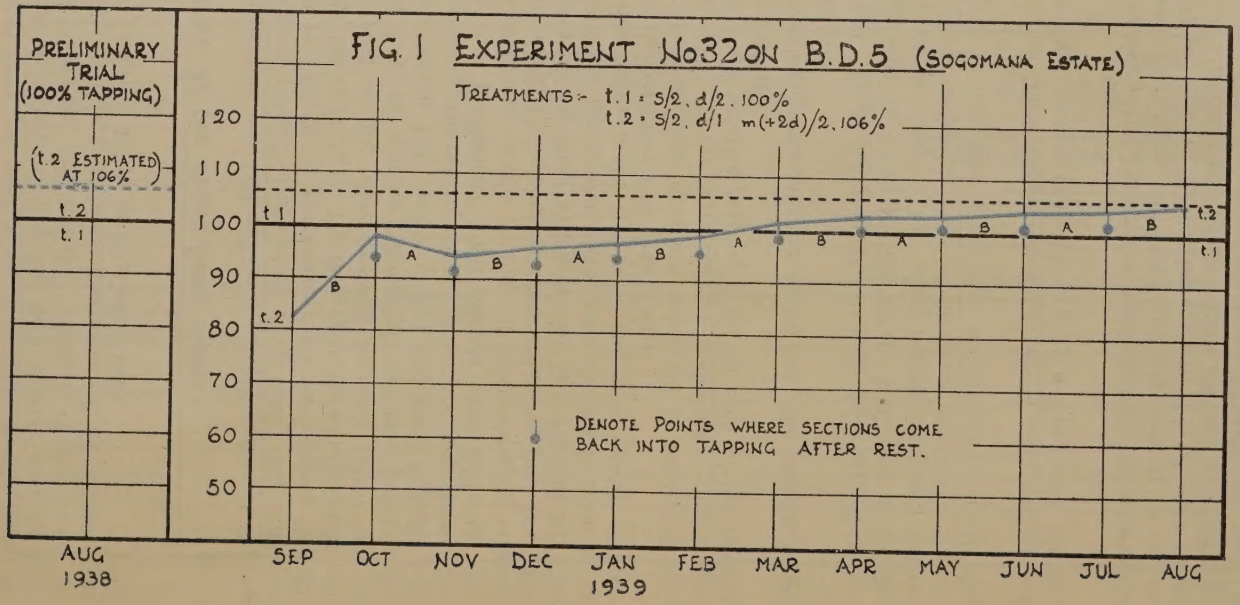
Modification of Daily Periodic System

A graph showing the daily yields of all plots of treatment t.2, totalled over twelve months tapping on the daily alternate-monthly system (from after the first monthly rest onwards—October 1938 to September 1939 inclusive) is presented elsewhere (Guest 1940). The daily yield curve rises to a peak at about the eighth day of the month (that is, the tenth tapping day if the two days flying start is counted) and then falls off rapidly until it intersects the progressive mean curve about the 15th day of the month (the 17th day of tapping).

The most economic period is the one which gives the highest mean yield per tapping. The above yield curves indicate that the benefit of the previous months rest is spent by the middle of each tapping month; during the second half of the month loss in crop increases daily until the next rest begins (*cf.* Rhodes and Mann, 1934; Sharp, 1938). Assuming that the flush crop would

YIELD-TREND OF TAPPING CUM MANURING EXPERIMENTS

MONTHLY PROGRESS OF TOTAL YIELD OF FIRST-GRADE RUBBER AS PERCENTAGE OF CONTROL TREATMENT (t.1): FIRST YEAR



not be reduced after less rest, more favourable results might be expected from daily periodic tapping with shorter periods, such a system as "alternate half-monthly" with a "flying start" of one day. To test this hypothesis, treatment t.2 was modified to S/2,d/1,0.5m (+1d)/1, 107% in December 1939.

Experiment No. 31 (on Prang Besar clones)

This experiment was laid out on a polyclone area at Sepang Estate, Selangor, towards the end of May 1938. The field had been budded in 1928-30, in successive rows with clones P.B. 23, 25, 31, 86, 123, 186 and S.R. 9. The budgrafts, then in their eleventh and twelfth year of life, were growing in girth at the rate of just over an inch per annum. Some of the trees had been in tapping since March 1935, while others had been brought into tapping at various subsequent dates. After the experiment had been marked out preliminary yield records were taken by sub-plots for three to four weeks in June on alternate-daily tapping.

Comparison of the tapping systems began on July 1st. The first application of fertiliser was given on July 4th and 5th. All plots, manured and unmanured alike, were cleared of cover along five-foot strips between the tree-rows and very lightly surface-forked after the fertilizer had been spread.

The principal tapping data are presented in Table III (see Appendix, p. 168). After adjusting for preliminary yield levels, relative yields and relative tapping costs on each of the tapping systems are indicated.

The following points may be noted from the results of the first tapping year.

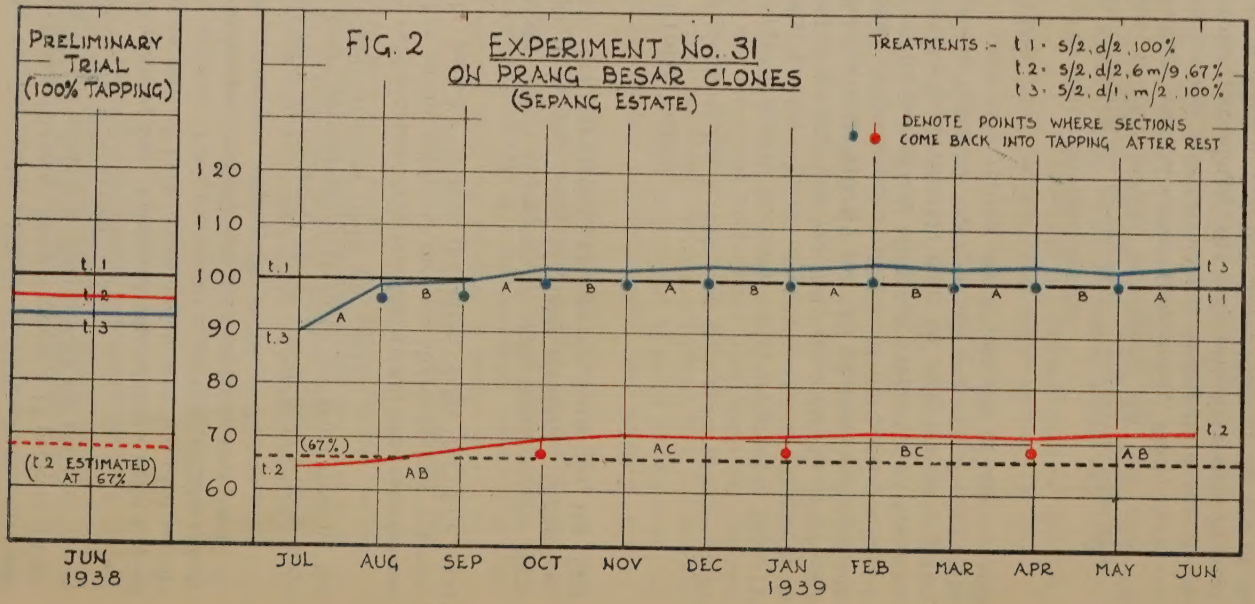
(a) *Yield.* Loss in crop on the alternate-daily periodic system (t.2) was only 24 per cent in spite of the reduction of tapping intensity by 33 per cent. That some benefit has been derived from flush yields following rest is therefore indicated. On the other hand there has been a net loss in potential crop of over 200 pounds per acre.

Benefit from flush yields following rest is also indicated on the daily periodic system (t.3) which gave a 9 per cent increase in crop.

(b) *Tapping cost.* Task-size is approximately the same on all three systems (280 trees per task); tapping cost is in inverse ratio to yield per tapper. Respective costs for t.1, t.2 and t.3 were 3.30, 2.90 and 3.02 cents per pound. Both periodic systems were economical, the 67% alternate-daily being 12 per cent and the 100% daily 8½ per cent cheaper than the normal cost on continuous

YIELD-TREND OF TAPPING-CUM-MANURING EXPERIMENTS

MONTHLY PROGRESS OF TOTAL YIELD OF FIRST-GRADE RUBBER AS PERCENTAGE OF CONTROL TREATMENT (t 1): FIRST YEAR



alternate-daily tapping (t.1). Unless there are other reasons for reducing tapping intensity, however, even a 12-per-cent lowering of tapping cost is unlikely to compensate for the high loss in potential crop on the 67% system (t.2).

(c) *Bark consumption.* Compared with alternate-daily tapping a slightly lower rate of bark consumption was recorded on the daily periodic system. Bark consumption on 67% alternate-daily periodic (5¾ inches per annum) was almost exactly two-thirds the rate on 100% continuous tapping (8½ inches or 22 cms.)

(d) *Proportion of low-grade rubber.* With daily tapping there was a much lower percentage of scrap (6 per cent) than on the two alternate-daily systems (9-10 per cent).

(e) *Dry rubber content of latex.* Mean d.r.c. was just over one per cent higher on the milder of the two alternate-daily systems. On the daily periodic system the mean value for d.r.c. was intermediate.

(f) *Growth.* Girth increments of trees tapped on the three systems were in inverse order of yields obtained. Differences, though small, are suggestive—as already noted in the first experiment.

Progress of Total Yield

Monthly yields of No. 1 rubber on each system, mean yields per sub-plot, and mean and progressive total yields per sub-plot expressed as percentages of the control (t.1) are given in Table IV (see Appendix, p. 169). Trend of yield is shown graphically in Fig. 2 in which the blue and red lines show the levels of yield from the daily periodic (100%) and the alternate-daily periodic (67%) systems as percentages of that of the control which is indicated by the horizontal bold black line. Table V (see Appendix, p. 170) gives the mean monthly d.r.c. on each system, together with the separate values for the A, B and C sub-plots of t.2. The rise in d.r.c. after each resting period and fall in later months should be noted.

Modification of Daily Periodic System

As in Experimental No. 32, the daily yield curve in treatment t.3 revealed that monthly periods of tapping and rest were too long. On analogy with the earlier argument (p. 150-1) the curves showed loss in crop from about the twenty-third day of the month onwards. Accordingly, the daily periodic system in treatment t.3 was modified to S/2, d/1, 3w/6, 100% at the end of the year.

Experiment No. 36 (on seedling trees)

The third experiment was laid out at Kalumpang Estate, Tanjong Malim, Selangor, in July 1938 on an area of comparatively young seedlings, planted originally on virgin soil. The trees were thirteen years old, and had been in tapping for nearly five years. Preliminary yield records were taken in August by sub-plots on the V/2,d/2,100% system.

Comparative tapping on the 100% continuous (treatment t.1) and 67% periodic (t.2) alternate-daily system began on October 1st. The first application of fertilisers was given early in October. The principal data obtained on the two tapping systems during the first year are presented in Table VI, (see Appendix, p. 174). As before, relative yields and tapping costs have been adjusted in accordance with the preliminary yield records.

The following are tentative comments:—

(a) *Yield.* Loss in crop on the 67% periodic system was only 22 per cent, while reduction in tapping intensity was 33 per cent; some benefit in the form of flush yields following rest is therefore indicated. On the other hand there was a loss of potential crop of approximately 230 pounds per acre.

(b) *Tapping cost.* Loss in potential crop may be partially offset by the saving of about 8½ per cent in tapping cost. But this small economy in cost would not become important unless the price of rubber fell very low and the cost of wages rose to a high level.

(c) *Bark consumption.* Rates of bark consumption on the two systems were not far from the expected ratio of just under 3:2 (=100:67). Extra bark consumed when cuts are re-opened after rest would account for the slightly higher rate per month when tapped on the periodic system (t.2). In this experiment bark consumption was conservative for 100% alternative-daily tapping in t.1—only 7½ inches (19 cms) per annum. On the 67% periodic system (t.2), the rate of bark consumption was the same as in Experiment No. 31 (5¾ inches).

(d) *Proportion of low-grade rubber.* Percentage of scrap was the same on both systems (10 per cent).

(e) *Dry rubber content of latex.* Mean monthly d.r.c. was 1½ per cent higher on the milder periodic system.

(f) *Growth.* Girth increments of trees tapped on the two systems were in inverse order of tapping intensities and yields, as also noted in the other two experiments. The difference, though small, is probably significant; it amounts to nearly half a centimetre per annum in girthing rate.

Progress of Total Yield

Monthly yields of No. 1 rubber, mean yields per sub-plot, and mean and progressive total yields per sub-plot of t.2 expressed as percentages of the control (t.1) are presented in Table VII (see Appendix, p. 175).

The mean monthly d.r.c. on each system, together with separate values for the A, B and C sub-plots of t.2, are given in Table VIII (see Appendix, p. 176).

Trend of yield month by month is shown graphically in Fig. 3, in which the red lines show the yield from the alternate-daily periodic system (67%) as a percentage of that of the control which is indicated by the horizontal bold black line.

Discussion

When rubber plantations reach maturity important questions of policy arise. Will it be best in the long run to tap conservatively, content with moderate yields provided they can be maintained indefinitely at economic cost? Would it not pay better to tap more intensively at first, obtaining large crops from the trees when they are young—guarding against deterioration and maintaining vigour by regular dressings of manure? Is the optimum intensity of tapping the same at all ages? Would it not be better to grade the amount of tapping and reduce intensity as the trees become older and less vigorous? If higher yields can be maintained by regular manuring of the trees from youth onwards, what quantities of fertiliser are required and how frequently can they be applied without turning gain into loss?

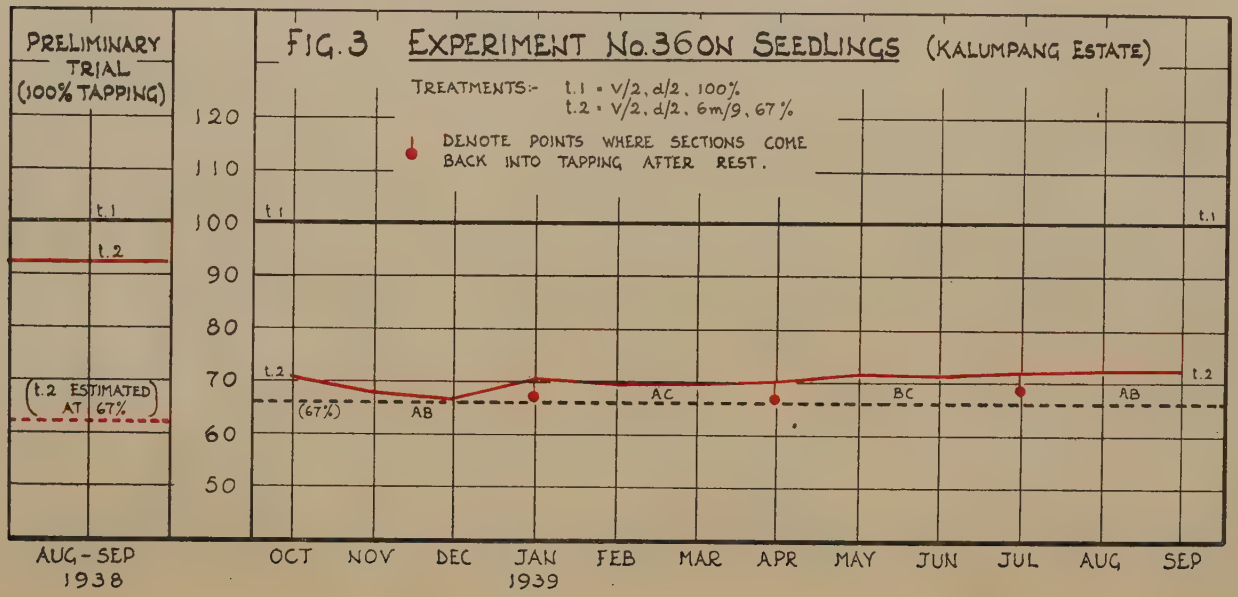
The series of tapping-cum-manuring experiments, of which the three described here are the first laid down, may in time throw light on these questions. The sites selected are all stands of relatively young trees, not more than 10-12 years old, either just approaching maturity when manuring started or brought into tapping within the previous five years. The results for one year presented in this paper have not revealed any fertiliser effects, either in growth or yield—so there are as yet no apparent interactions between manuring and tapping to be discussed.

Judged on tapping only the three experiments are not easy to group together. The tapping systems are not the same in all, nor is the experimental material the same. Nevertheless, one or two points may be noted, even at this early stage.

Alternate-daily periodic tapping at 67% intensity ("A.B.C.") is compared with the normal 100% continuous system in Experiments Nos. 31 and 36. The relative yields of the periodic system were

YIELD-TREND OF TAPPING CUM MANURING EXPERIMENTS

MONTHLY PROGRESS OF TOTAL YIELD OF FIRST-GRADE RUBBER AS PERCENTAGE OF CONTROL TREATMENT (t.1): FIRST YEAR



75.6 per cent and 73.4 per cent respectively while relative tapping costs were 87.9 per cent and 91.4 per cent. The periodic system at 67% intensity (A.B.C.) has resulted in a 10 per cent increase in yield per tapping and a reduction in tapping cost of the same order.

Against this must be offset the immediate loss in potential crop of from 200 to 250 pounds per acre. Very substantial future advantages will have to be demonstrated before it can be proved that so conservative a system of tapping as 67% periodic is the most economic for healthy young trees. The 1 to 1½ per cent higher d.r.c. and the slightly better growth-rate on this system are pointers in this direction, but only pointers as yet.

Daily periodic tapping. The two daily alternate-monthly systems in Experiments Nos. 31 and 32 are not quite the same. The former, with flying starts, is the 106% system of Sumatra; the latter, without flying starts, is the more usual 100% system sometimes practised in Malaya.

In Experiment No. 32 daily periodic tapping has proved, if anything, inferior to alternate-daily. This may be partly because of the age of the trees, which are still too young to respond favourably to periods as long as a month, and partly to the clone (B.D. 5). In Experiment No. 31, on the other hand, daily periodic tapping has proved about 9 per cent more efficient than normal alternate-daily, indicating the benefit of flush yields following rest, as on alternate-daily periodic. The lower proportion of low-grade rubber is an advantage of daily tapping; but, although the mean d.r.c. was higher the high monthly range of fluctuations is a drawback, especially when the crop is marketed as latex and not as sheet. Here again, the slightly lower growth-rate suggests that extra yields may be obtained at the expense of the future.

Acknowledgments

Acknowledgment is due to Mr. R. C. Grant, Mr. F. H. Brunton and Mr. A. W. Bird, Managers of the three estates where these experiments are situated, and to their staffs for their ready co-operation in carrying out all routine field work, to Mr. R. O. Jenkins, at whose original suggestion this series of experiments was planned, and to the Directors of the Planting Companies concerned for providing sites on their estates.

Standard errors of treatment-means were calculated by Mr. H. Fairfield Smith, Statistician at the Institute, in collaboration with whom the experiments were designed. Mr. Chew Gim Ang has been mainly responsible for the tabulation of the records.

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2nd July, 1940

APPENDIX

History, Lay-out and Other Basic Details of each Experiment

Details of the site, experimental material, history and lay-out of the three tapping-cum-manuring experiments on young mature rubber trees are given in this appendix, together with plans showing arrangement of plots in the field. These are followed by tables recording the data collected during the first year of the experiments. There is also a note on the method of recording.

EXPERIMENT No. 32 (ON CLONE B.D.5)

Sogomana Estate—Field T

Site. An almost flat rectangular block of 50-60 acres of clay loam (coastal alluvium), originally planted from high virgin jungle. The area is uniform, as indicated by growth and general appearance of the trees.

Crop history. A monoclone block of budgrafts of clone Bodjong Datar 5. Planted (20 ft. x 20 ft.) in 1929 and budded in December 1930/June 1931. The stand of trees, which has never been thinned, was about 95 per acre immediately before the commencement of the experiment in June 1938, with about 87 tappable trees to the acre (at a standard of 18 inches girth or more at 25 inches above the union). The trees were healthy and well shaped in appearance, but of medium size for their age and thin in leaf canopy.

Tapping commenced in July 1938 in the eighth year after budding, the first panel being opened at 25 inches above the union and tapped on a half-spiral cut sloped at 45°. Initial mean girth of tappable trees in each plot was uniform (mean deviation from the mean: 1-2% in each block). Average girth of tappable trees over the whole area was 63 cms. (25 inches) at 55 inches above the union, corresponding to an average growth-rate of about 3¼ inches per annum since budding.

Lay-out. The layout is factorial 2 x 4 x 2 (two tapping treatments x four levels of manuring, replicated in two blocks). Each of the sixteen plots consists of a single tapping task of about 300 trees. The plots are mostly long and narrow; they are separated by double lines of guard trees, as shown in the plan (Fig. 4).

Tapping treatments

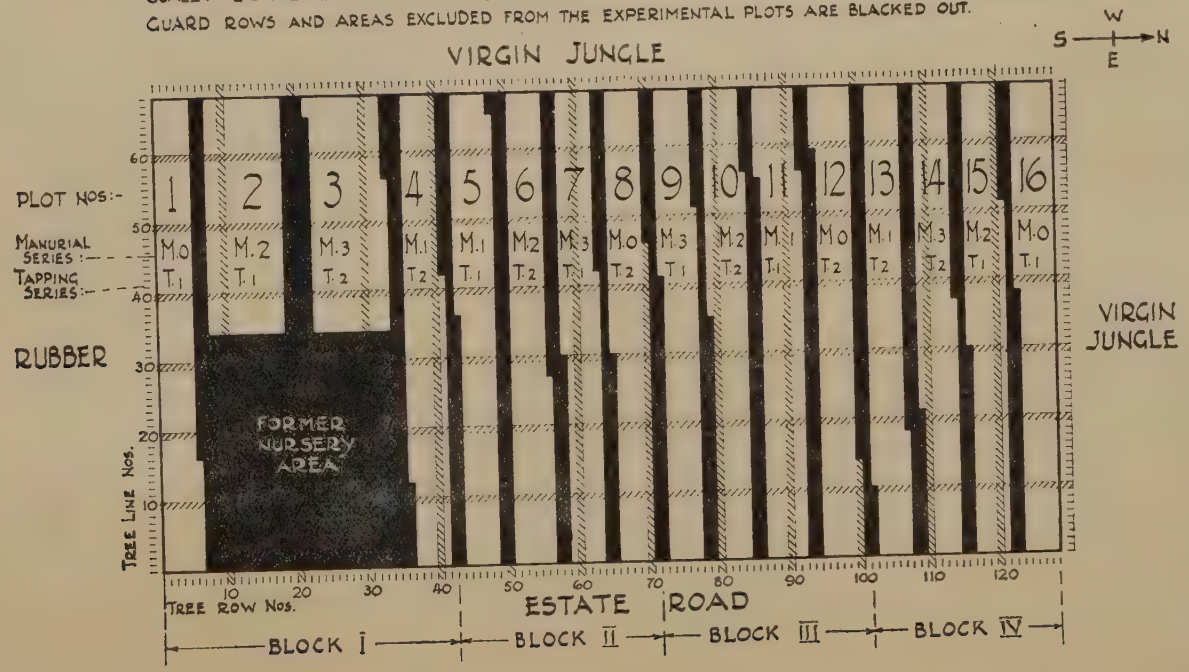
t.1 = alt.-daily tapping: alternate-daily continuous on half-circumference (S/2,d/2,100%).

t.2 = daily periodic: daily tapping on half-circumference, with equal periods of tapping and rest. Period to be modified from time to time as results indicate to optimum "economic periods." System started as "daily alternate-monthly" with two days "flying start" at the beginning of each tapping period (S/2,d/1,m(+2d)/2,106%).

TAPPING-CUM-MANURING EXPERIMENT. Nº32 ON CLONE B.D.5 (Sogomana Estate, Perak.)

Scale :- □ = one planting square (20'x20'). Every tenth row or line of tree squares is shaded

Guard rows and areas excluded from the experimental plots are blacked out.



Manurial treatments

m.0 = control—unmanured (cultivation otherwise identical with other treatments).

m.1 = manured with an inorganic mixture at unit rate.

m.2 = „ „ „ „ „ „ double „

m.3 = „ „ „ „ „ „ treble „

The mixture consists of 16 parts sulphate of ammonia, 8 parts of Nicifos B, 8 parts of Christmas Island rock phosphate and 3 parts of sulphate of potash, analysing 13.5% N, 12.8% P_2O_5 and 4.1% K_2O (N: P_2O_5: K_2O = 3 : 3 : 1 approx.) applied in 1938 and 1939, and biennially thereafter.

Rates of application for the first two dressings 1½, 3 and 4½ lb. per tree (approximately 160, 320 and 480 lb. per acre respectively). Grass and other creeping covers cleared and bushy (natural) covers slashed along five-foot strips b tween the tree-rows at the time of application in manured and unmanured plots alike; fertiliser broadcast and very lightly forked into the top soil.

Task-size and Tapping Procedure. Plots were marked out initially as tasks of 300 trees each in all blocks. After making allowance for casualties, untappable and diseased trees, the final task size when all budgrafts have reached the tappable standard should not exceed 320-330 trees. The area of each task or plot, as determined by the number of planting points, varies from 3.3 to 3.4 acres. (Guard rows between plots are grouped into commercial tasks, the yields of which are not recorded separately). Tamil tappers on daily wages tap the experimental plots, eight tappers being employed daily. To eliminate possible variations in tapping skill, tappers are moved round to new plots monthly or bi-monthly in accordance with a semi-randomised scheme of rotation. The standard of tapping on this estate is high and, in spite of bumpy bark on many trees, there is little wounding; rates of bark consumption are uniform.

TABLE I

Experiment No. 32 (Sogomana Estate)

Annual Summary by Tapping Treatment. 1st year

Tapping treatments*:—	t.1	t.2
	alt.-daily continuous	daily periodic
Amount and Intensity of Tapping		
Total tapping days (including four bulked†)	325	325 + 20‡
Average number of tappings per plot ...	162.5	172.5
Amount of tapping: mean in circs. per plot	81.25	86.25
RELATIVE INTENSITY of tapping per plot, (per cent)	**100**	**106**
(Total acreage of plots)	(26.9)	(26.7)
Total tree-tappings, based on monthly tree-count	383,446	406,716
(Relative intensity of tapping per tree) (per cent)	(100.0)	(106.1)
Yield (in pounds per acre per annum)		
No. 1 dry sheet	539	570
Dry scrap	68	63
Add proportion bulk crops†	3	3
Total dry rubber (± 11.8)	610	636
(Preliminary yield-level—Aug. 1938) ...	(100.0)	(100.1)
Adjusted RELATIVE YIELD	**100.0**	**103.4**
Dry rubber content of latex		
Mean monthly d.r.c. per cent	32.9	31.7
Low-grade crops		
Scrap as percentage total rubber ...	11%	10%
Bark consumption		
Rate in centimetres per annum	22.9	22.7
Growth (in centimetres)		
Mean girth (at 55″) in Oct. 1938	63.30	63.38
Mean girth (at 55″) in Oct. 1939	66.33	66.15
Annual girth increment (±0.143)	3.03	2.77
(No. of trees measured)	(432)	(442)
Tapping Cost		
Total crop recorded† in pounds (all grades)	16,336	16,906
Total number of tapper-days	1,300	1,300
Mean yield per tapper in pounds ...	12.57	13.00
Adjusted yield per tapper in pounds ...	12.57	13.00
(Average tapper's daily wage in cents) ...	(37.12)	(37.12)
Tapping cost in cents per pound	2.95	2.86
RELATIVE TAPPING COST	**100.0**	**96.9**

* **Tapping systems:—t.1 = s/2, d/2, 100%**
t.2 = s/2, d/1, m(+ 2d)/2, 106%

† To avoid underestimation of annual yield the bulk crop is noted on days when plots yields cannot be recorded on account of rain interference between times of commencement of tapping and collection of latex.

‡ From the third month onward the daily periodic plots were given two days "flying start" immediately before the commencement of each tapping period in accordance with Sumatra practice, making a total of twenty additional afternoon tappings in the year. Relative intensity of treatment t.2 for the given year is thus 106 per cent and not 100 per cent, as it would be flying starts.

TABLE II

Experiment No. 32 (Sogomana Estate)

Monthly Yields of First-grade Rubber and Mean Monthly Dry Rubber Content of Latex. 1st year

Month	Treatment t.1 Alternate-daily cont. tapping (S/2,d/2,100%)		Treatment t.2 Daily periodic tapping (S/2,d/1,m(+d)/2,106%)			
	Monthly yield in pounds (8 plots)	Mean monthly d.r.c. (per cent)	Mean monthly d.r.c. (per cent)	Monthly yield in pounds (A & B, 4 plots each) A	Monthly yield in pounds (A & B, 4 plots each) B	Progressive total yield as percent of t.1
1938 September	1221	27.8	24.6		995	82.1
October	1329	29.4	29.7	1495	—	98.0
November	1505	29.4	29.4	—	1334	94.5
December	1459	29.0	29.3	1478	—	96.3
1939 January	1457	31.1	31.4	—	1458	97.1
February	1271	31.6	31.7	1343	—	98.4
March	829	33.9	32.5	—	1048	101.0
April	790	35.7	32.8	939	—	102.4
May	896	35.5	34.6	—	921	102.5
June	883	36.4	35.0	1036	—	103 6
July	1439	36.9	34.7	—	1540	104.0
August	1437	37.9	34.7	1628	—	104.9
Total	14506	32.9 (mean)	31.7 (mean)	7919	7296	
				15215		
Preliminary Period (on S/2,d/2,100%)						
Aug. '38	1284	28.4	28.6	1286		100.1

EXPERIMENT No. 31 (ON POLYCLONE PLANTING OF PRANG BESAR CLONES)

Sepang Estate—Field 19B

Site. The experimental plots are on gently sloping land, and the soil is derived from Triassic shale, varying from sandy loams to clay loams. The sandy loam areas are found in the South-Eastern portion, plots 22-27, and plots 1-10. In the clay loam areas, which are in the higher sections, lateritic gravel occurs at 24"-36" below the surface, chiefly in plots 28-31, 12-16, and 20-21.

Plots 39-42 are low lying, and the soil here is an alluvial, organic heavy loam to clay loam.

Crop history. The trees are polyclone budgrafts mostly of Prang Besar clones, planted (15 ft. x 15 ft.) in 1926 and budded in 1928-30. The clones are P.B. 23, 25, 31, 86, 123, 186 and S.R.9, planted in successive rows. Owing to thinning, the exact composition is not known. In June 1938 there was still a stand of about 150 to the acre, reduced to 120 by removal of stunted and diseased trees soon after the commencement of the experiment. Taking into consideration the high density at maturity the trees were well grown and carried a good canopy of foliage.

The area was brought into tapping in March 1935, in the 5th to 7th year since budding, the first panel being opened at 25 inches on cuts sloped at 20°. This panel was turned over a few inches above the union and the second panel opened at 40 inches. New trees were brought into tapping subsequently at the original height of opening, so that the position of the cuts is variable and there is no simultaneous turn-over. Height of tapping on all trees was recorded when the experiment commenced and the average height per sub-plot was found to be reasonably uniform (mean deviation of sub-plot means from the general mean = 5%, max. deviation = 13%): approximately two-fifths of the cuts were still on the first panel. Mean height of tapping for all trees was 77 cms (30 inches) above the union.

Mean girth of tappable trees was 63 cms. (25 inches) at 55 inches above the union, corresponding to an average growth-rate of 2½ inches to 3 inches per annum since budding. The average girth per sub-plot was uniform (mean deviation = 3.5%).

Yields for the two complete tapping years before commencement of the experiment were as follows:

1936—375 pounds per acre (6th-8th year from budding).

1937—593 pounds per acre (7th-9th year from budding).

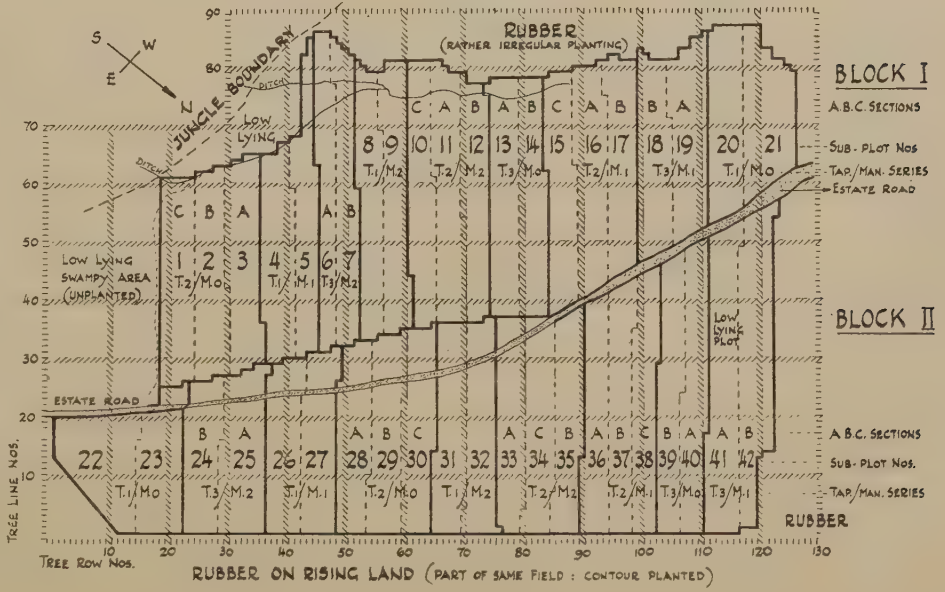
The yield for the second year would no doubt have been higher if it had not been for restriction, since no attempt was made to fill vacant tasks in 1937.

Lay-out. The lay-out is factorial 3 x 3 x 2 (three tapping treatments x three levels of manuring, replicated in two blocks). Each plot comprises either two or three sub-plots (half-tasks of about 140 tappable trees each) representing A, B and C sections for periodic tapping and rest in treatment t.2 and A and B sections in treatment t.3. A plan of the experimental plots is shown in Fig. 5.

TAPPING CUM MANURING EXPERIMENT. No 31 ON PRANG BESAR CLONES.

(POLYCLONE PLANTING) (SEPANG ESTATE, SELANGOR)

SCALE :- □ ONE PLANTING SQUARE (15'x15'). EVERY TENTH "ROW" OR "LINE" OF TREE SQUARES IS SHADED



RUBBER ON RISING LAND (PART OF SAME FIELD : CONTOUR PLANTED)

Tapping treatments

t.1 = 100% continuous—alternate-daily tapping on half-circumference (S/2,d/2,100%).

t.2 = 67% periodic— alternate-daily tapping on half-circumference with periods of six months tapping and three months rest (S/2,d/2,6m/9,67%).

t.3 = 100% periodic— daily tapping on half-circumference, with equal periods of tapping and rest. Periods to be modified from time to time as results indicate to optimum economic periods. System started as "daily alternate-monthly" without flying start (S/2,d/1,m/2,100%).

Manurial treatments

m.0 = unmanured (cultivation otherwise identical with other treatments).

m.1 = biennial applications of an inorganic mixture at unit rate.

m.2 = „ „ „ „ „ „ „ double „

The mixture consists of 3 parts of sulphate of ammonia, 1 part of Nicifos B, 2 parts of Christmas Island rock phosphate and 1 part of sulphate of potash, analysing 11% N, 12% P_2O_5 and 7% K_2O. ($N : P_2O_5 : K_2O = 2 : 2 : 1$ approx). Rates of application are 250 pounds per acre and 500 pounds per acre respectively (about 1.8 and 3.7 pounds per tree). The fertilizer is broadcast along cleared strips (4-6 feet wide) between the tree-rows and very lightly forked into the top soil to a depth of one to two inches.

There are no guard rows, but an isolation trench 9 inches wide x 18 inches deep is maintained between all plots with different fertilizer treatments so as to reduce "poaching."

Task-size and Tapping Procedure. Before commencement of the experiment this area was divided into tasks of 400 trees and tapped by Chinese contract tappers. The Manager of the estate considered this larger than the economic size. For experimental tapping, tasks of 280 trees each were considered sufficient, Tamil tappers on daily wages being substituted for the original Chinese.

Each tapper was made to tap two sub-plots belonging to the same combined treatment. Sub-plots were grouped in pairs corresponding to the main plots of treatment t.1 and either the AB, BC or CA sections of treatment t.2 As frequency of tapping in both these treatments is alternate-daily Block I is tapped on one day and Block II on the next. As regards treatment t.3, on daily periodic tapping, the A sub-plots in both blocks were grouped in pairs for tapping in one month and the B sub-plots in the next. The same nine tappers are thus employed to tap the experiment daily, each tapper working in a pair of sub-plots of each of the nine combinations of treatments (3 x 3).

To eliminate possible variations in tapping skill tappers are moved round to new plots monthly on a semi-randomised scheme of rotation. The best tappers on the estate are employed in the experimental plots and the standard of tapping is excellent.

TABLE III

Experiment No. 31 (Sepang Estate)

Annual Summary by Tapping Treatments. 1st year

Tapping treatments*:—	t.1	t.2	t.3
	100% cont. alt-daily	67% per. alt-daily	100% daily periodic
Amount and Intensity of Tapping			
Total tapping days (including nineteen bulked†)	304	304	304
Average number of tappings per su-plot‡	152.0	101.3	152.0
Amount of tapping: mean in circs. per sub-plot	76.00	50.65	76.00
RELATIVE INTENSITY of tapping per sub-plot (per cent)	**100**	**67**	**100**
(Total acreage of plots)	(12.10)	(17.90)	(12.96)
Total tree-tappings, based on monthly tree-count	238,536	236,932	236,133
(Relative intensity of tapping per tree) ...	(100.0)	(66.1)	(99.0)
Yield (in pounds per acre per annum)			
No. 1 dry sheet	1035	766	1000
Dry scrap	110	74	63
Add proportion of bulk crops†	35	25	32
Total dry rubber (± 35.4)	1180	865	1095
(Preliminary yield-level: uniformity trial—June 1938)	(100.0)	(95.6)	(91.4)
Adjusted RELATIVE YIELD	**100.0**	**75.6**	**108.9**
Dry rubber content of latex			
Mean monthly d.r.c. percent	36.8	38.0	37.4
Low-grade crops			
Scrap as percentage total rubber	10%	9%	6%
Bark consumption			
Rate in centimetres per annum	21.8	14.6	21.1
Growth (in centimetres)			
Mean girth (at 55″) in July 1938	62.17	62.59	64.09
Mean girth (at 55″ in July 1939	64.72	65.18	66.42
Annual girth increment (± 0.121)	2.55	2.65	2.33
(No. of trees measured)	(412)	(623)	(409)
Tapping Cost			
Total crop recorded† in pounds (all grades)	13,850	15,025	13,781
Total number of tapper-days	912	912	912
Mean yield per tapper in pounds ...	15.15	16.47	15.11
Adjusted yield per tapper in pounds ...	15.15	17.23	16.53
(Average tapper's daily wage in cents) ...	(50.00)	(50.00)	(50.00)
Tapping cost in cents per pound	3.30	2.90	3.02
RELATIVE TAPPING COST	**100.0**	**87.9**	**91.5**

* Tapping systems:—t.1 = s/2, d/2, 100%
t.2 = s/2, d/2, 6m/9, 67%
t.3 = s/2, d/1, m/2, 100%

† See footnote to table I on bulk crop records.

‡ Each plot of treatments t.1 and t.3 is sub-divided into two sub-plots and each plot of treatment t.2 into three (A, B and C) sub-plots, of approximately 140 tappable trees. Record, are kept by sub-plots so that A, B and C yields can be separated for the study of several effects.

TABLE IV

Experiment No. 31 (Sepang Estate)

Monthly Yields of First-grade Rubber (in pounds). 1st year

Month (1938–39)	Treatment t.1 — 100 per cent alt.-daily cont. (S/2,d/2, 100%)		Treatment t.2 — 67 per cent alt.-daily periodic (S/2,d/2,6m/9,67%)						Treatment t.3 — 100 per cent daily periodic S/2,d/1,m/2,100%)				
	Yield of 12 sub-plots		Yield of eighteen sub-plots						Yield of twelve sub-plots				
	Monthly totals	Mean per sub-plot	Monthly totals (A, B & C, each six sub-plots)			Mean per sub-plot	Yield per sub-plot as percentage of t.1		Monthly totals (A & B, each six-sub-plots)		Mean per sub-plot	Yield per sub-plot as percentage of t.1	
			A	B	C		Monthly mean	Progressive total	A	B		Monthly mean	Progressive total
July	1311	109.2	646	606	—	69.6	63.7	63.7	1169	—	97.4	89.2	89.2
Aug.	808	67.3	411	398	—	44.9	66.7	64.9	—	908	75.7	112.5	98.1
Sept.	986	82.2	544	524	—	59.4	72.3	67.2	994	—	82.8	100.7	98.2
Oct.	943	78.6	522	—	545	59.3	75.4	69.1	—	1039	86.6	110.2	101.5
Nov.	1061	88.4	537	—	660	66.5	75.2	70.4	1068	—	89.0	100.7	101.4
Dec.	1154	96.2	546	—	650	66.4	69.0	70.1	—	1233	102.8	106.9	102.4
Jan.	1324	110.3	—	671	786	80.9	73.3	70.7	1354	—	112.8	102.3	102.4
Feb.	1269	105.8	—	669	737	78.1	73.8	71.2	—	1365	113.8	107.6	103.1
Mar.	1035	86.2	—	551	591	63.4	73.5	71.4	1003	—	83.6	97.0	102.5
Apr.	531	44.3	284	299	—	32.4	73.1	71.5	—	602	50.2	113.3	103.0
May	1013	84.4	684	571	—	69.7	82.6	72.5	947	—	78.2	93.5	102.2
June	1088	90.7	691	580	—	70.6	77.8	72.9	—	1227	106.5	117.4	103.5
Total	12523		4865	4869	3969				6535	6424			
Mean monthly (per sub-plot)		87.0	67.6	67.6	55.1	63.4	72.9		90.8	89.3	90.1	103.4	
Mean per month tapped		87.0	90.1	90.2	110.3	96.9	111.4		181.5	178.5			
Preliminary Period (on S/2,d/2,100%)													
June 1938	953	79.4	457	431	450	75.2	94.6		442	434	73.0	92.0	

NOTE:—Under treatment t.2 the bars (———) denote where sections have been brought back into tapping after rest.

TABLE V

Experiment No. 31 (Sepang Estate)

Mean Monthly Dry Rubber Content of Latex (per cent.). 1st year

Month (1938-39)	Treatment t.1 100 per cent alt.-daily cont. (S/2,d/2, 100%)	Treatment t.2 67 per cent alt.-daily periodic (S/2,d/2,6m/9,67%)				Treatment t.3 100 per cent periodic (S/2,d/1,m/2, 100%)	
		A	B	C	Mean	A	B
July	34.4	34.8	34.4	—	34.6	—	33.8
August	35.5	36.0	36.0	—	36.0	37.5	—
September	36.9	36.0	35.9	—	36.0	—	36.1
October	34.7	33.5	—	40.5	37.0	34.1	—
November	36.7	36.3	—	36.3	36.3	—	36.0
December	36.0	35.6	—	35.2	35.4	35.6	—
January	38.1	—	44.1	38.2	41.2	—	37.2
February	39.2	—	39.8	38.9	39.4	38.2	—
March	39.5	—	40.2	40.3	40.3	—	41.1
April	37.9	44.4	40.4	—	42.4	40.0	—
May	38.8	40.1	39.5	—	39.8	—	40.1
June	38.2	38.4	38.5	—	38.5	39.3	—
Mean	37.2	37.2	38.8	38.2	38.1	37.5	37.4

NOTE:—Bars (———) in the means column under treatment t.2 denote where resting sections have been brought back into tapping.

EXPERIMENT No. 36 (ON SEEDLING TREES)

Kalumpang Estate—Field 73½ acres

Site. This experiment is laid out in a rather irregular-shaped field planted originally from virgin jungle, and now under a mixed cover of rubber seedlings and indigenous shrubs.

The experimental blocks extend over gently undulating land, and the soil is reasonably uniform. The main type is a lateritic heavy loam to clay loam soil, tawny yellow in colour and derived from Triassic shale. In plots 29 and 30, the soil becomes a paler yellow and heavier in texture. The laterite gravel occurs from 24 inches to 36 inches below the surface. The main soil variation occurs in plots 1, 6, 11 and 16 on a low lying area, where soil is a dark brown alluvial clay.

The experimental plots occupy some 45 acres; within blocks, treatments were allocated at random in the usual way. Where manured and unmanured plots were contiguous they were separated by several guard rows of non-experimental trees; but between plots with similar manuring (albeit different tapping treatments) guard rows were deemed unnecessary. Blocks I and II (across which the two largest of these groups of plots fall) are uniform and occupy the main rectangular section of the field; they are moreover separated from the edge of the field by a border of six or more rows of non-experimental trees. Block III is more irregular both in shape and in tree-content: the minimum border of non-experimental trees here is only two rows and, as the surrounding areas are very variable, appreciable border effects (which may not fall equally on all plots) are possible. When the experiment was laid out the site of Block III was realised to be far from ideal, but no other suitable areas of correct age and type could be found. If the standard error of Block III is too large, data from it may be rejected.

Crop history. The trees are seedlings, planted in 1925 at a spacing of 20 ft. x 20 ft. (108 points to the acre). At the commencement of the experiment there was a uniform stand of approximately 96 per acre, the trees being well-grown and carrying a fairly dense canopy of foliage.

The field was brought into tapping in November 1933 at 8 years since planting, the first panel being opened at 12 inches and tapped on the V/2,d/2,100% system. The second panel was opened at 24 inches; and cuts were opened again above the first panel at 36 inches in April 1937. From the end of 1936 less intensive periodic tapping was introduced (V/2,d/2,6m/9.67%); the cuts had reached a height of about 30 inches in 1938 and were still on virgin bark when the experiment was laid out. The slope of cut is about 20°.

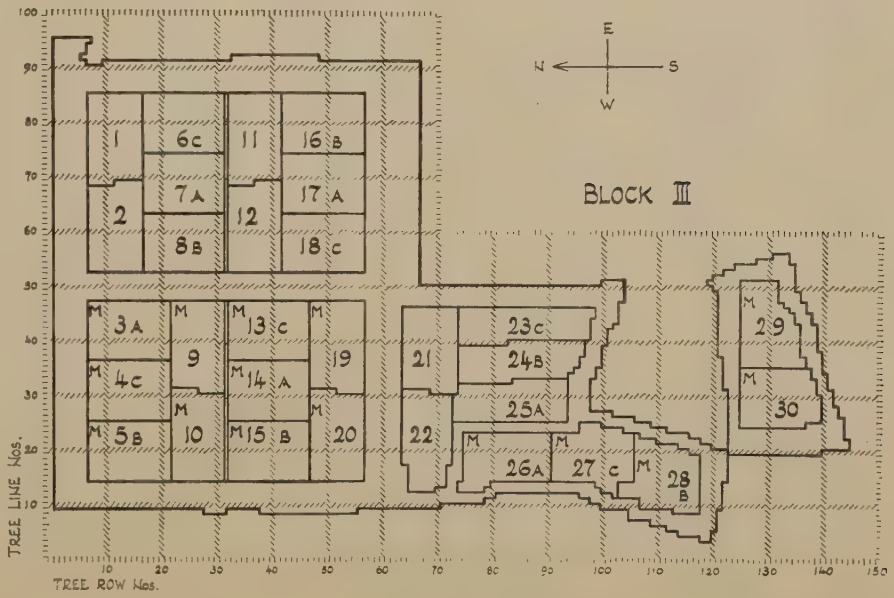
Mean girth of tappable trees was 82-83 cms. (say 32 inches) at 55 inches above the ground in October 1938, corresponding to an average growth-rate of 2½ inches per annum since planting. The average girth per sub-plot was reasonably uniform in Blocks I and II (mean deviation = 12-14 per cent) but rather variable in Block III (mean deviation = 32 per cent).

Past yield records for this field are not available, but the level of yield in the four tapping years (on low cuts) was reckoned to be about 700 lb. per acre (at 100% intensity of tapping).

TAPPING-CUM-MANURING EXPERIMENT. No 36. ON SEEDLINGS.

(KALUMPANG ESTATE, SELANGOR.)

SCALE:- 1 ONE PLANTING SQUARE (20'×20'). EVERY TENTH "ROW" OR "LINE" OF TREE SQUARES IS SHADED



Lay-out. The layout is factorial 2 x 2 x 3 (two tapping treatments x two levels of manuring, replicated in three blocks). Each plot comprises either two or three sub-plots (half tasks of 130-140 tappable trees), representing A, B and C sections for periodic tapping in treatment t.2 (one sub-plot of the three is always resting). The plan of the experimental area is given in Fig. 6.

Tapping treatments

t.1 = 100 per cent continuous—alternate daily tapping on half-circumference cut (V/2,d/2,100%).

t.2 = 67 per cent periodic— alternate daily tapping on half-circumference cut with periods of six months' tapping and three months' rest (V/2,d/2,6m/9,67%).

Manurial treatments

m.0 = unmanured (cultivation otherwise identical with t.2).

m.1 = manured biennially with an inorganic mixture.

The mixture consists of 6 parts of sulphate of ammonia, 2 parts of Nicifos B, 2 parts of Christmas Island rock phosphate and 1 part of sulphate of potash, analysing 14.8% N, 10.1% P_2O_5 and 4.3% K_2O. ($N : P_2O_5 : K_2O = 3 : 2 : 1$ approx). The first dressing was at the rate of 4 lb. per tree (say 3½ cwt. per acre) and subsequent biennial dressings will be at the rate of 5 lb. per tree.

Task-size and Tapping Procedure. The whole experiment is tapped (on alternate days only) by twelve Tamil tappers who are moved round to new plots at the end of each month in accordance with a semi-randomised scheme of rotation. Each plot comprises a single tapping task of 270-280 trees, but yields of A, B and C sub-plots are kept separate so that seasonal resting effects can be determined.

TABLE VI

Experiment No. 36 (Kalumpang Estate)

Annual Summary by Tapping Treatments. 1st year

Tapping treatments*:—	t.1	t.2
	100% cont.	67% per.
Amount and Intensity of Tapping		
Total tapping days, ‖ (including three bulked†)	174	174
Average number of tappings per sub-plt‡	174.0	116.0
Amount of tapping: mean in circs. per sub-plot	87.0	58.0
RELATIVE INTENSITY of tapping per sub-plot	**100%**	**67%**
(Total acreage of plots)	(18.0)	(27.0)
Total tree-tappings, based on monthly tree-count	285,012	281,111
(Relative intensity of tapping per tree) ...	100.0.	65.5
Yield (in pounds per acre per annum)		
No. 1 dry sheet	770	556
Dry scrap	81	60
Add proportion bulk † crops	6	5
Total dry rubber (± 17.9)	857	621
(Preliminary yield-level: uniformity trial— Aug./Sept. 1938)	(100.0)	(98.6)
Adjusted RELATIVE YIELD	**100.0**	**73.4**
Dry rubber content of latex		
Mean monthly d.r.c. percent	35.1	36.7
Low-grade crops		
Scrap as percentage total rubber	10%	10%
Bark consumption		
Rate in centimetres per annum	19.1	14.7
Growth (in centimetres)		
Mean girth (at 55") on 16/11/38	82.7	82.8
Mean girth (at 55") on 25/10/39	84.9	85.4
Difference (± 0.17)	2.2	2.6
Annual girthing rate	2.4	2.8
Tapping Cost		
Total crop recorded† in pounds (all grades)	153,210	166,332
Total number of tapper-days	1044	1044
Mean yield per tapper in pounds ...	14.68	15.93
Adjusted yield per tapper in pounds ...	14.68	16.16
(Average tapper's daily wage in cents) ...	(42.47)	(42.47)
Tapping cost in cents per pound	2.89	2.64
RELATIVE TAPPING COST	**100.0**	**91.4**

* Tapping systems:—t.1 = v/2, d/2, 100%
t.2 = v/2, d/2, 6m/9. 67%

‖ In this experiment, since both systems are on alternative-daily tapping, the whole experimental area is tapped every other day and rested on intermediate days.

† See footnote to table I on bulk yield records.

‡ Records are kept by sub-plots so that A, B and C yields can be separated for the study of seasonal effects (i.e. Experiment No. 2).

TABLE VII

Experiment No. 36 (Kalumpang Estate)

Mean Monthly Dry Rubber Content of Latex (per cent). 1st year

Month (1938-39)	Treatment t.1 100% continuous (V/2,d/2,100%)		Treatment t.2 67% periodic (V/2,d/2,6m/9,67%)					
	Yield of 12 sub-plots		Yield of eighteen sub-plots					
	Monthly totals	Mean per sub-plot	Monthly totals (A, B & C, each six sub-plots			Mean per sub-plot coverable	Yield per sub-plot as percentage of t.1	
			A	B	C		Monthly mean	Progressive total
October	1,008	84.0	509	561	—	59.4	70.7	70.7
November	1,001	83.4	467	505	—	54.0	64.7	67.7
December	1,244	103.6	588	620	—	67.1	64.8	66.6
January	1,360	113.4	—	724	890	89.7	79.1	70.3
February	1,235	102.9	—	567	633	66.6	64.7	69.1
March	1,302	108.5	—	663	699	75.7	69.8	69.2
April	984	82.0	572	—	543	61.9	75.8	70.0
May	1,035	86.3	702	—	605	72.6	84.1	71.6
June	1,258	104.8	669	—	633	72.4	69.1	71.3
July	1,109	92.4	629	688	—	73.2	79.2	72.0
August	1,170	97.5	609	689	—	72.1	73.9	72.2
September	1,151	95.9	604	643	—	69.3	72.3	72.2
Total	13,857	—	5,349	5,660	4,003	—	—	—
Mean monthly (per sub-plot)		96.2	74.3	78.6	55.6	69.5	72.2	—
Mean per month tapped		96.2	99.1	104.8	111.2	105.0	108.3	—
Preliminary Period (on S/2,d/2,100%)								
Aug./Sept. 1938	1,651	137.6	121.1	136.9	127.3	126.4	93.4	—

NOTE:—Bars (——) under treatment t.2 denote where sections have been brought back into tapping after rest.

TABLE VIII

Experiment No. 36 (Kalumpang Estate)

Monthly Yields of First-grade Rubber (in pounds). 1st year

Month (1938-39)	Treatment t.1 100% cont. (V/2,d/2, 100%)	Treatment t.2 67% periodic (V/2,d/2,6m/9,67%)			
		A	B	C	Mean
October	34.3	35.0	34.8	—	34.9
November	33.5	33.3	32.8	—	33.1
December	34.0	35.1	34.8	—	35.0
January	35.9	—	37.5	44.4	41.0
February	36.7	—	35.9	37.4	36.7
March	35.9	—	37.1	37.2	37.2
April	34.3	40.6	—	34.6	37.2
May	34.8	39.0	—	36.0	37.5
June	34.7	35.9	—	34.9	35.4
July	35.4	36.5	42.3	—	39.4
August	37.1	35.1	37.0	—	36.1
September	35.0	36.8	37.2	—	37.0
Mean	35.1	36.4	36.6	37.4	36.8

NOTE:—Bars (———) in means column under treatment t.2 denote where sections have been brought back into tapping after rest.

METHOD OF RECORDING

Method of recording yield is substantially the same in all three experiments. The latex from each sub-plot is taken to the factory in numbered buckets, and weighed to the nearest half pound. On one estate the tappers' buckets are of standard tare; on the other two a large bucket of known tare is used for all weighings. (The pointer of the scale is set to read zero when the bucket is empty, so that the weight of latex can be read off directly). Scrap is brought in at the same time and weighed to the nearest quarter pound.

After weighing, the latex is strained to remove lump and then replaced in the tapper's bucket. A 100 m.l. sample is next taken by dipper and placed with an equal volume of water in a numbered pan. Formic acid is added for coagulation (10 cc. of 2% solution) and 10 cc. of paranitrophenol solution poured in to prevent mould growing on the sheet. After standing for about 2½ hours the coagulum is rolled into a thin biscuit-sheet, marked with the date and sub-plot number in indelible pencil, washed and hung up to dry in the factory. The biscuits are hung to dry in the sun on the following morning and then replaced on hooks for further air drying in an open cabinet. They are sent in to the Rubber Research Institute at the end of the month, where they are weighed to the nearest 0.1 gram. The d.r.c. thus determined in gram per 100 m.l. is adjusted to per cent by weight, as indicated in this *Journal*, (1939) **9**, 233 (Communication 244), dry weight of No. 1 rubber harvested each day per sub-plot is then calculated.

Dry weight of scrap is reckoned at 80% of the wet weight recorded in the factory. Conversion tables have been prepared to facilitate estimation of d.r.c. and dry scrap.